

CLAIMS

WHAT IS CLAIMED IS:

1. A method of facilitating protection switching, comprising:
 - identifying a failure predicted one of a plurality of protected system elements; and
 - implementing a protection switching operation for switching designated information from the failure predicted one of said protected system elements to a protection system element.
2. The method of claim 1 wherein identifying the failure predicted one of said protected system elements includes assessing at least one of a plurality of failure prediction parameters of said protected system elements for determining when a failure prediction condition has been met by one of said protected system elements.
3. The method of claim 1 wherein identifying the failure predicted one of said protected system elements includes:
 - monitoring a failure prediction parameter of at least one of the plurality of protected system elements; and
 - correlating a present state of the failure prediction parameter to a failure prediction criterion for determining whether the failure prediction parameter has been met a failure prediction condition.
4. The method of claim 3 wherein monitoring the failure prediction parameter includes monitoring an element demerit point value, a rate of change of the element demerit point value, an element demerit point value threshold limit, a number of active connections, a number of active service subscribers, a performance value specified in a respective service agreement a data bit rate and a rate of change of the data bit rate.

5. The method of claim 3 wherein the monitoring the failure prediction parameter further comprises bridging the protection system element across the at least one of the plurality of the protected system elements.
6. The method of claim 3 wherein the monitoring the failure prediction parameter further comprises sequentially bridging the protection system element across each of the plurality of the protected system elements.
7. The method of claim 6 wherein correlating the present state of the failure prediction parameter to the failure prediction criterion further comprises correlating when anomalies in the failure prediction parameter are consistent across the plurality of the protected system elements.
8. The method of claim 7 further comprising the step of:
when the anomalies in the failure prediction parameter are consistent across the plurality of the protected system elements, inferring a fault in the protection system element.
9. The method of claim 1 wherein identifying the failure predicted one of said protected system elements includes assessing performance of said protected system elements based at least partially on an element demerit point level of each one of said protected system elements.
10. The method of claim 9 wherein assessing performance of said protected system elements includes determining when an element demerit point level of one of said protected system elements has exceeded a predetermined element demerit point threshold limit.
11. The method of claim 10 wherein the predetermined element demerit point threshold limit is associated with a first level of failure probability, lower than an element demerit point threshold limit corresponding to a next higher level of failure probability.

12. The method of claim 9 wherein the element demerit point level corresponds to a quantity of element demerit points accumulated over a designated period of time.
13. The method of claim 1 wherein identifying the failure predicted one of said protected system elements includes determining that a rate of change of element demerit points for one of said protected system elements has exceeded a predetermined element demerit point rate of change threshold limit.
14. The method of claim 1 wherein identifying the failure predicted one of said protected system elements includes determining that a failure prediction parameter corresponding to a service agreement parameter for one of said protected system elements has declined to a predetermined minimal acceptable service agreement parameter level.
15. The method of claim 1, further comprising:
determining that a protection switching priority among a collection of failure predicted system elements applies to the failure predicted one of said protected system elements.
16. The method of claim 15 wherein implementing the protection switching operation is initiated after determining that the protection switching priority applies to the failure predicted one of said protected system elements.
17. The method of claim 15 wherein determining that the protection switching priority applies to the failure predicted one of said protected system elements includes assessing a protection switching priority parameter for each system element of the collection of failure predicted system elements.
18. The method of claim 17 wherein assessing the protection switching parameter includes assessing at least one of a parameter relating to element demerit points, a parameter relating to a rate of change of said element demerit points, a parameter relating to an element demerit point threshold limit, a parameter relating to a number of active connections, a parameter relating to a number of

active service subscribers, a parameter designated in a service agreement, a mounted position in a network element, an administrator-assigned priority value, a data bit rate and a rate of change of the data bit rate.

19. The method of claim 1, wherein implementing the protection switching operation includes:

downloading service information of the failure predicted one of said protected system elements to the protection system element after identifying the failure predicted one of said protected system elements;

confirming failure of the first failure predicted one of said protected system elements; and

switching communication service supported by the failure predicted one of said protected system elements for being supported by to the protection system element after confirming said failure.

20. The method of claim 19, further comprising:

determining that a protection switching priority among a collection of failure predicted system elements applies to the failure predicted one of said protected system elements; and wherein

downloading service information of the failure predicted one of said protected system elements is performed after determining that the protection switching priority applies to the failure predicted one of said protected system elements.

21. The method of claim 19 wherein determining that the protection switching priority applies to the failure predicted one of said protected system elements includes assessing a protection switching priority parameter for the collection of failure predicted system elements.

22. The method of claim 21 wherein assessing the protection switching parameter includes assessing at least one of a parameter relating to element demerit points, a parameter relating to a rate of change of said element demerit points, a parameter relating to an element demerit point threshold limit, a parameter

relating to a number of active connections, a parameter relating to a number of active service subscribers, a parameter designated in a service agreement, a mounted position in a network element, an administrator-assigned priority value, a data bit rate and a rate of change of the data bit rate.

23. The method of claim 19 wherein the protection system element provides protection switching functionality exclusively for all of said protected system elements.

24. The method of claim 19 wherein:

identifying the failure predicted one of said protected system elements includes determining that a failure prediction parameter associated with the failure predicted one of said protected system elements has exceeded a failure prediction parameter first threshold limit; and said switching communication service is initiated in response to the failure prediction parameter exceeding a failure prediction parameter second threshold limit different than the failure prediction parameter first threshold limit.

25. The method of claim 24 wherein the failure prediction first threshold limit is associated with a first level of failure probability and the failure prediction second threshold limit is associated with a second level of failure probability higher than the first level of failure probability.

26. The method of claim 19 wherein:

identifying the failure predicted one of said protected system elements includes determining that a failure prediction parameter associated with the failure predicted one of said protected system elements has exceeded a failure prediction parameter first threshold limit; and confirming failure includes determining that the failure prediction parameter has exceeded a failure prediction parameter second threshold limit different than the failure prediction parameter first threshold limit.

27. The method of claim 1, wherein identifying the failure predicted one of said protected system elements includes determining that a failure prediction parameter associated with the failure predicted one of said protected system elements has exceeded a failure prediction parameter first threshold limit.
28. The method of claim 27 wherein implementing said protection switching operation is performed in response to determining that the failure prediction parameter has exceeded a failure prediction parameter second threshold limit different than the failure prediction parameter first threshold limit.
29. The method of claim 1 wherein the protection system element provides protection switching functionality exclusively for all of said protected system elements.
30. The method of claim 1, further comprising:
 - configuring protection switching variables associated with the protection switching operation.
31. The method of claim 30 wherein configuring said protection switching variables includes:
 - associating each one of said protected system elements with the protection system element; and
 - specifying failure prediction criterion for each of said protected system elements.
32. The method of claim 31 wherein specifying said failure prediction criterion includes specifying a first type of failure prediction criterion for a first portion of said protected system elements and a second type of failure prediction criterion for a second portion of said protected system elements.
33. The method of claim 31 wherein specifying said failure prediction criterion includes specifying said failure prediction criterion on a per protected system element basis.

34. The method of claim 31, further comprising:
 - specifying a protection switching priority for at least a portion of said protected system elements.
35. The method of claim 1 wherein identifying the failure predicted one of said protected system elements includes assessing a protection switching operation initiation notification issued via a system administrator user interface.
36. The method of claim 34 wherein implementing the protection switching operation includes:
 - downloading service information of the failure predicted one of said protected system elements to the protection system element after identifying the failure predicted one of said protected system elements; and
 - switching communication service supported by said failure predicted one of said protected system elements for being supported by the protection system element after downloading said service information.

37. A method of facilitating protection switching, comprising:

- monitoring a failure prediction parameter of at least one of the plurality of protected system elements;
- correlating a present state of the failure prediction parameter to a failure prediction criterion for determining whether one of said protected system elements has been met a failure prediction condition, thereby identifying a failure predicted one of a plurality of protected system elements when the failure prediction condition is met;
- determining that a protection switching priority among a collection of failure predicted system elements applies to the failure predicted one of said protected system elements;
- downloading service information of the failure predicted one of said protected system elements to the protection system element after identifying the failure predicted one of said protected system elements, wherein downloading said service information is performed after determining that the protection switching priority applies to the failure predicted one of said protected system elements;
- confirming failure of the failure predicted one of said protected system elements; and
- switching communication service supported by the failure predicted one of said protected system elements for being supported by to the protection system element after confirming said failure.

38. The method of claim 37 wherein correlating includes determining that an element demerit point level of one of said protected system elements has exceeded a predetermined element demerit point threshold limit.

39. The method of claim 38 wherein the predetermined element demerit point threshold limit is associated with a first level of failure probability, lower than

an element demerit point threshold limit corresponding to a next higher level of failure probability.

40. The method of claim 38 wherein the element demerit point level corresponds to a quantity of element demerit points accumulated over a designated period of time.

41. The method of claim 37 wherein correlating includes determining that a rate of change of element demerit points for one of said protected system elements has exceeded a predetermined element demerit point rate of change threshold limit.

42. The method of claim 37 wherein correlating includes determining that the failure prediction parameter corresponding to a service agreement parameter for one of said protected system elements has declined to a predetermined minimal acceptable service agreement parameter level.

43. The method of claim 37 wherein determining that the protection switching priority applies to the failure predicted one of said protected system elements includes assessing at least one of a parameter relating to element demerit points, a parameter relating to a rate of change of said element demerit points, a parameter relating to an element demerit point threshold limit, a parameter relating to a number of active connections, a parameter relating to a number of active service subscribers, a parameter designated in a service agreement, a mounted position in a network element, an administrator-assigned priority value, a data bit rate and a rate of change of the data bit rate.

44. The method of claim 37 wherein the protection system element provides protection switching functionality exclusively for all of said protected system elements.

45. A method of facilitating protection switching, comprising:

- facilitating a protection switching configuration operation wherein a failure prediction condition for at least a portion of a plurality of protected system elements is defined;
- facilitating a failure confirmed protection switching operation in response to identifying that the failure prediction condition for one of said protected has been met during operation of said protected system elements; and
- facilitating an administrator-initiated protection switching operation in response to receiving an administrator-issued protection switching initiation notification.

46. The method of claim 45 wherein facilitating the protection switching configuration operation includes:

- associating each one of said protected system elements with the protection system element; and
- specifying failure prediction criterion for each of said protected system elements.

47. The method of claim 46 wherein specifying said failure prediction criterion includes specifying a first type of failure prediction criterion for a first portion of said protected system elements and a second type of failure prediction criterion for a second portion of said protected system elements.

48. The method of claim 47 wherein specifying said failure prediction criterion includes specifying said failure prediction criterion on a per protected system element basis.

49. The method of claim 46, further comprising:

- specifying a protection switching priority for at least a portion of said protected system elements.

50. The method of claim 45 wherein facilitating the failure confirmed protection switching operation includes:

downloading service information of the failure predicted one of said protected system elements to the protection system element after identifying the failure predicted one of said protected system elements;
confirming failure of the first failure predicted one of said protected system elements; and
switching communication service supported by the failure predicted one of said protected system elements for being supported by to the protection system element after confirming said failure.

51. The method of claim 50, further comprising:

determining that a protection switching priority among a collection of failure predicted system elements applies to the failure predicted one of said protected system elements prior to downloading said service information.

52. The method of claim 45 wherein facilitating a failure confirmed protection switching operation includes:

downloading service information of the failure predicted one of said protected system elements to the protection system element after identifying the failure predicted one of said protected system elements;
confirming failure of the first failure predicted one of said protected system elements; and
switching communication service supported by the failure predicted one of said protected system elements for being supported by to the protection system element after confirming said failure.

53. The method of claim 45 wherein:

identifying the failure predicted one of said protected system elements includes determining that a failure prediction parameter associated

with the failure predicted one of said protected system elements has exceeded a failure prediction parameter first threshold limit; and confirming failure includes determining that the failure prediction parameter has exceeded a failure prediction parameter second threshold limit different than the failure prediction parameter first threshold limit.

54. An apparatus capable of facilitating protection switching, comprising:

- a plurality of protected system element;
- a protection system element including a data processor and capable of providing protection switching functionality for at least one of said protected system elements; and
- a data processor program, wherein the data processor program is capable of enabling the protection system element to facilitate:
 - identifying a failure predicted one of said protected system elements; and
 - implementing a protection switching operation for switching designated information from the failure predicted one of said protected system elements to the protection system element.

55. A data processor program product, comprising:

 a data processor program processable by a data processor; and
 an apparatus from which the data processor program is accessible by the
 data processor; wherein
 the data processor program is capable of enabling the data processor to
 facilitate:
 monitoring a failure prediction parameter of at least one of the plurality of
 protected system elements;
 correlating a present state of the failure prediction parameter to a failure
 prediction criterion for determining whether one of said protected
 system elements has been met a failure prediction condition,
 thereby identifying a failure predicted one of a plurality of
 protected system elements when the failure prediction condition is
 met;
 downloading service information of the failure predicted one of said
 protected system elements to the protection system element after
 identifying the failure predicted one of said protected system
 elements;
 confirming failure of the failure predicted one of said protected system
 elements; and
 switching communication service supported by the failure predicted one of
 said protected system elements for being supported by to the
 protection system element after confirming said failure.